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(54) **Food browning agent.**

(57) A browning agent particularly for use in microwave cooking comprises collagen, or gelatine hydrolysed to its constituent amido acids, plus one or more reducing sugars and alkalis.

The collagen preferably is derived from bovine hides. The alkali is preferably a mixture of sodium carbonate and bicarbonate.

The prowning agent is capable of browning at 100°C or less, down to about 70°C.

It may be incorporated into a film or used as a powder or a liquid.

EP 0 203 725 A1

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FOOD BROWNING AGENT

The present invention relates to a food browning agent, that is to say a composition which, when added to food facilitates the browning of the food and particularly the browning of the external surface of the food during cooking.

Many browning agents have been prepared but many of them suffer from the disadvantage that they introduce undesirable flavour into the food and may also introduce colouring e.g. food dye.

One of the natural browning reactions of food during conventional cooking is caused by the well-known Maillard reaction which is the reaction between reducing sugars and the amino acids of the proteins in the food. This reaction, however, only occurs at normal cooking temperatures and does not occur fast enough at temperatures encountered in microwave ovens. The present invention is based on the Maillard reaction but is catalysed by the adition of alkali to allow the reaction to take place at lower temperatures.

An object of the present invention is to provide a colourless browning agent which has a substantially neutral flavour and is subsequently undetectable on the cooked food and thus does not interfere with the food but produces a desirable browning effect during cooking, specifically during cooking with microwave ovens.

According to the present invention, a food browning composition comprises collagen or gelatine which has been substantially completely hydrolysed to its constituent amino acids and to which has been added one or more reducing sugars and one or more alkalis.

Preferably collagen is employed which is derived from a pure source such as a bovine (ox or cow) hide. If gelatine is employed it is preferably derived from the same source. By using collagen derived from a pure source the resultant browning agent is substantially colourless and has a flavour, compatible with natural food flavouring.

This can be explained by the fact that collagen, particularly when derived from a pure source such as cow or ox hide contains substantially very low levels of sulphur containing amino acids (0.5% methionine, cysteine absent in type 1 collagen) which may give rise to strong undesirable food flavours. Consequently, the collagen derived browning agent, being substantially free from sulphur containing amino acids, does not introduce undesirable flavours into the food during cooking.

Glutamic acid will be released during acid hydrolysis and the sodium glutamate formed during neutralisation will act as a flavour enhancer or taste synergist when the browning agent is used in cooking.

One reason why a browning agent in accordance with this invention is very successful compared with known browning agents is that collagen contains a higher proportion of glycine that any other naturally occurring protein used in foodstuffs. Collagen contains about 33% glycine whereas other readily available protein sources contain much lower percentages of glycine, e.g. egg white 5.5% and casein 3.5%.

The presence of the high glycine content results in a very good browning performance particularly when used with meat in microwave cooking.

The browning composition may in addition to the amino acids resulting from the hydrolysis of the

collagen contain additional gelatine and/or a substance which enhances food adhesion.

The alkali is preferably a mixture of sodium carbonate and sodium bicarbonate. A preferred reducing sugar is glucose.

For example, there may be 1.8 parts by weight of glucose and 0.8 parts by weight of sodium carbonate and 1.4 parts by weight of sodium bicarbonate to every one part by weight of acid hydrolysed collagen.

The browning agent can be in the form of a powder, a paste, a solution or can be incorporated in a film. Preferably the film, in this instance, would be in the form of a "cling-film", i.e. a very thin film which may be wrapped around and cling to meat or other food.

A typical browning agent in accordance with the present invention contains one part by weight of acid hydrolysed collagen or gelatine which has been neutralised and evaporated to dryness, 1.8 parts by weight of glucose and 2.2 parts by weight of a mixture of sodium carbonate and bicarbonate, the whole being reduced to a fine powder. If this powder is incorporated in a collagen film, the weight of the film being approximately ten times the weight of the applied browning agent, a useful browning film is produced for application to foodstuff.

From another aspect the invention relates to a method of producing a food browning agent comprising:-

a. acid hydrolysing collagen or gelatine to its constituent amino acids;

b. neutralising the solution of amino acids;

c. evaporating the solution until dry;

d. adding a reducing sugar;

e. adding a mixture of sodium carbonate and bicarbonate to catalyse the reaction and provide a

buffering effect; and

f. reducing the product to a fine powder.

The method may also comprise adding gelatine or a polysaccharide such as locust bean gum before reducing to a fine powder.

One method of producing the food browning agent of the present invention will now be described. The starting material is a collagen pulp dispersion containing 10% collagen and 90% water. This pulp is derived from good quality cow or ox hide comminuted into quarter inch (0.64 centimeter) pieces and then ground or otherwise reduced to pulp in water.

Ten litres of the collagen pulp solution is heated to 100° Centrigrade. The solution is cooled to room temperature and any lipids formed on the surface removed. 1.5 litres of 10M hydrochloric acid are added and the solution refluxed for 24 to 36 hours (the amino acids being checked by hplc).

On cooling, approximately 3 litres of 5M sodium hydroxide or sodium phosphate solution are added (to pH approximately 7). The solution is then evaporated to dryness to yield approximately 1.9 kilograms of solid material comprising amino acids and sodium chloride. The process has now produced the desired acid hydrolysed collagen. A typical browning agent may be manufactured by adding to the hydrolysed collagen a reducing sugar such as ribose or glucose and a base such as a mixture of sodium carbonate and bicarbonate which catalyses and therefore speeds up the browning reaction when the browning agent is used. Other reducing sugars which may be used are, for example, mannose, fructose, maltose, galactose and arabinose.

The reducing sugar and sodium carbonate and bicarbobate may be added with or without additional

gelatine or a polysaccharide and the whole milled to a fine powder.

This powder may be used by sprinkling it on food or it may be used in a concentrated solution in water which is brushed or otherwise applied to food or it may be cast into the form of a film of e.g. gelatine or collagen.

Incorporation of the browning agent of this invention into a collagen film may be effected as follows:-

Collagen pulp is swollen in alkali and comminuted at low temperature (5-20°C). The browning ingredients, acid hydrolysed collagen and sugar are added to the resulting gel and mixed under high shear (15-25°C). Sodium carbonate and bicarbonate, gelatine or a polysaccharide gum are also added at this stage. Glycerol is added, (to plasticise the resulting film) and the gel degassed under vacuum.

The film is then cast and the gel air dried to yield a film for food applications.

In a particular example of this process, 3 litres of a 1% collagen pulp in water (i.e. 30g collagen) is adjusted to pH 10 with a 1M sodium hydroxide solution. The pulp undergoes comminution, keeping the temperature between 5-20°C, to form a flowable gel like colloidal dispersion, hereinafter referred to as a gel. 1g of acid hydrolysed collagen and 1.8g of glucose are added and the gel mixed under high shear (15-25°C). 2.2g of a mixture of sodium carbonate and bicarbonate are added and 2g of gelatine may also be added at this point. Glycerol (10 ml) is added and the gel degassed under vacuum. A film is then cast, partially neutralised and dried by a current of air (25-30°C). This yields a film for food applications of area around 0/7 m2.

If gelatine or polysaccharide is added to the browning agent it is preferably 1 to 4 parts by weight to one part by weight of the acid hydrolysed collagen.

Typical examples of browning agents made in accordance with this invention using different sugars are:-

Acid Hydrolysed Collagen	7.2g	16.8%
Fructose	12.4g	29.0%
Sodium bicarbonate	10.0g	23.4%
Sodium carbonate	6.0g	14.0%
Locust bean gum	7.2g	16.8%

Acid Hydrolysed Collagen	7.2g	13.1%
Maltose	24.4g	45.5%
Sodium bicarbonate	10.0g	18.3%
Sodium carbonate	6.0g	11.0%
Locust bean gum	7.2g	13.1%

Preferred formulation		
Acid Hydrolysed Collagen	7.2g	16.7%
Glucose	12.8g	29.6%
Sodium bicarbonate	10.0g	23.1%
Sodium carbonate	6.0g	13.9%
Locust bean gum	7.2g	16.7%

The browning agent has been found particularly effective when used on meat which is cooked in microwave ovens. The browning agent has a particular advantage in relation to microwave ovens in that it is very difficult to brown meat satisfactorily in a microwave oven without using special apparatus. By using a film or powder embodying the present invention, and covering the meat with it, browning is produced without the use of additional heating or hot air sources which are conventionally used for browning meat in a microwave oven.

An advantage of the browning agent embodying the present invention is that it will brown at temperatures of 100°C or less, e.g. down to 70°C.

CLAIMS

1. A food browning composition or agent comprising collagen or gelatin which has been substantially completely hydrolysed to its constituent amino acids and to which has been added one or more reducing sugars and one or more alkalis.

2. A composition according to claim 1 where the collagen is derived from animal hides.

3. A composition according to claim 2 where the collagen is derived from bovine hides.

4. A composition according to claim 3 to which a film forming capability can be imparted by the incorporation of collagen, any other film forming protein or carbohydrate material.

5. A composition according to claim 4 where the film forming collagen is derived from bovine hides.

6. A composition according to any preceding claims where the reducing sugar is a ketose or aldose or a mixture thereof.

7. A composition according to any of claims 1 to 6 where the reducing sugar is a pentose or hexose or a mixture thereof.

8. A composition according to any preceding claim whose pH lies between 7.0 and 10.0 and preferably between 9.0 and 9.5.

9. A composition according to any preceding claim which remains substantially colourless at ambient temperature.

10. A composition according to any preceding claim whose flavour is compatible with natural food flavours.

11. A composition according to any preceding claim which is capable of browning by application of heat or by induction of heat from microwave energy when the product temperature is raised to 70°C or higher.

12. A composition according to any preceding claim which can exist and be applied in the form of a liquid, powder, paste or film.

13. A composition according to claim 2 where the molar ratio of reducing sugar to amino acids is between 1:1 and 4:1 and preferably between 2:1 and 3:1.

14. A browning composition according to any preceding claim added to a film forming gel and admixed thoroughly prior to extrusion or casting of the film.

15. A composition according to claim 14 where the film is a collagen sausage casing.

16. The application of a composition according to any preceding claim to uncooked meat, fish, and poultry or products derived therefrom to effect browning during heating.

17. A method of producing a food browning agent comprising:-

a. acid hydrolysing collagen or gelatine to its constituent amino acids;

b. neutralising the solution of amino acids;

c. evaporating the solution until dry;

d. adding a reducing sugar;

e. adding a mixture of sodium carbonate and bicarbonate to catalyse the reaction and provide a buffering effect; and

f. reducing the product to a fine powder.

18. A method according to claim 17 including adding gelatine or a polysaccharide such as locust bean gum before reducing to a fine powder.

19. A food browning composition substantially as hereinbefore particularly described.

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EUROPEAN SEARCH REPORT

Application number

EP 86 30 3208

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl 4)
A	US-A-3 925 561 (H. HERSTEL et al.) * column 1, lines 55-66, claim 1 * ---		A 23 L 1/27 A 23 L 1/272 A 23 L 1/275
A	PATENT ABSTRACTS OF JAPAN, vol. 6, no. 102 (C-107)[980], 11th June 1982; & JP - A - 57 31962 (HASEGAWA KORYO) 20-02-1982 ---		
A	DE-C- 975 577 (DR. AUGUST OETKER) * claim 1 * -----		

TECHNICAL FIELDS SEARCHED (Int. Cl 4)

A 23 L 1/00

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
BERLIN	17-08-1986	SCHULTZE D

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
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T : theory or principle underlying the invention
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